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Public Provision of Private Goods and The Redistribution of Income

By TIMOTHY BESLEY AND STEPHEN COATE*

Most governments devote considerable resources to the provision of private goods such as health, housing, and education. Moreover, many such schemes are universal in the sense that everyone is eligible and provision is free.¹ In the United Kingdom, for example, the National Health Service (NHS) offers free health care to all citizens, while in the United States the public school system provides free high school education. The purpose of this paper is to point out that such universal provision schemes can redistribute income from the rich to the poor, even if they are financed by a head tax.

The key to our argument is a discrete-choice model between private- and public-sector consumption in which individuals demand at most one unit of the publicly provided good while caring about its quality. This seems reasonable for a number of cases. Parents want their children to have a high school education, and individuals' health care needs are manifested in the form of a demand for a particular course of treatment. It is typically neither desirable nor even possible for a child to attend two schools at once or for an individual to receive health care from two different sources simultaneously. This is not to say, however, that all units of these goods are identical.

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¹We are interested in schemes which are de jure universal. As we show in our analysis, this does not imply that they are de facto universal.

High school educations and medical treatments are available at different quality levels.

Focusing on discrete choice in this way gives us a basis for arguing that universal provision can effect redistribution from the rich to the poor. If individuals can consume at most one unit of a good, then doing so in the public sector restricts the individual to consuming the good at the publicly set quality level. Some individuals may prefer to consume the good at a higher quality level in the private sector even if this means having to pay for it. This is consistent with what we observe in practice: some individuals in Britain obtain their health care in the private sector despite the existence of the NHS, and many parents in the United States do not take advantage of the public school system even though there are no fees.

Herein lies the power of universal public-provision schemes to be redistributive. Provided that the quality level chosen in the public sector is not "too high," some households will choose not to consume the publicly provided good and will instead pay for a higher-quality good in the private sector.² Assuming that quality is a normal good, the households who opt out of the public sector will be those with higher incomes. Thus, the benefits of public provision will be enjoyed exclusively by those with low incomes.

In the next section, we develop this idea in the context of a simple two-good general

²We are assuming that individuals cannot perfectly supplement their public-sector allocations (i.e., there is no alternative good that is a perfect substitute for quality). Hence, while parents might hire a private tutor to educate their children during after-school hours, this is not the same thing as raising the quality of public education. Any imperfect substitutes for public-sector quality can thus be regarded as other goods for the purposes of our analysis.

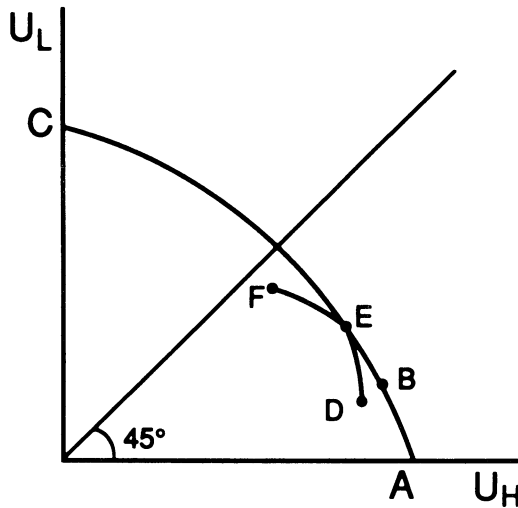


FIGURE 1. THE ECONOMY'S PARETO FRONTIER (AC) AND UTILITY-FEASIBILITY FRONTIER (DEF) WITH PUBLIC PROVISION WHEN $q_g^{\max} > q_g^*$

equilibrium model. Whether this suggests that public-provision programs should be used to redistribute income in practice is, however, moot. While our analysis shows that public-provision schemes can redistribute from rich to poor, it also shows that they involve deadweight loss. There may exist alternative redistributive instruments that can achieve distributional goals at lower efficiency cost. We return to this point in the conclusion.

I. The Redistributive Potential of Universal Public Provision

We consider an economy with two goods, a numeraire z and a good of which agents consume either zero or one unit. This indivisible good is, however, available at various levels of quality which we denote by $q \in [\underline{q}, \bar{q}]$. There are two groups of individuals: those with low incomes (the "poor") and those with high incomes (the "rich"). Each high-income individual has an endowment of the numeraire or "income" y_H , while each low-income individual has income y_L , where $y_L < y_H$. We use γ_L to denote the fraction of low-income individuals. Individu-

als' preferences between the two goods are identical and are represented by the utility function $u(q, z)$. We adopt the convention that $q = 0$ if an individual consumes none of the indivisible good. We assume that $u(q, z)$ is smooth and increasing in both of its arguments. We shall also assume that the utility function is strongly quasi-concave and that both goods are normal. These assumptions imply that the marginal rate of substitution between quality and the numeraire $[u_q(q, z)/u_z(q, z)]$ is decreasing in q and increasing in z .

The economy uses a technology that transforms pq units of the numeraire into one unit of the indivisible good of quality q . Producers are assumed to behave competitively so that the market price of one unit of quality q is just pq . Thus, we can think of p as the price of quality at the margin.

Consider first the market equilibrium of this economy³. Each individual will choose the quality level that maximizes his utility given the price p . Of course, a consumer may decide not to consume the good at all, in which case the quality level he chooses will be zero. Let $q(p, y)$ denote the demand function for quality and let $v(p, y)$ denote the indirect utility function of an individual with income y . Then, in the market equilibrium, poor individuals obtain utility $v(p, y_L)$, while rich individuals enjoy utility $v(p, y_H)$. We know from the first fundamental welfare theorem that the utility pair achieved with the market allocation can be represented by a point, such as B, on the economy's Pareto frontier denoted by AC in Figure 1.

Now consider a public-provision scheme in which a fixed quality level, denoted by q_g , is provided free of charge to all those who wish to take it. To focus on redistribution through public provision rather than via the tax system, we will assume that public provision is financed by a head tax T . Individuals must now decide whether to consume the good in the public or private sector. The

³The results in this section are developed in greater detail in a technical appendix available from the authors upon request.

utility of consumers of type i ($i \in \{L, H\}$) will be higher if they consume in the public sector if $u(q_g, y_i - T)$ exceeds $v(p, y_i - T)$. If both groups consume in the public sector, then the head tax must equal $p q_g$, while it is $\gamma_L p q_g$ when only the poor do so.

Universal provision of a quality level that induces both groups to participate in the public sector can never make sense on redistributive grounds, since both rich and poor are likely to be worse off under such a scheme.⁴ This is on account of the dead-weight loss inherent in the provision of goods rather than cash. We know that each individual would be better off with a cash transfer equal to the cost of the quality level with which he is provided [i.e., $u(q_g, y - T) \leq v(p, y + p q_g - T)$], because then he could choose the quality level that suits him best. If both groups of individuals consume the indivisible good in the public sector, then each individual's taxes are equal to the cost of the publicly provided quality (i.e., $T = p q_g$), and the members of neither group will typically receive the quality level that they would like. Indeed, at least one group must be worse off. The utility allocation will therefore lie to the southwest of B in Figure 1 (i.e., it is Pareto-inferior to the market).

Therefore, for present purposes we are interested in those quality levels that attract only the poor to consume in the public sector. We shall refer to a quality level with this property as being *separating*. We can identify the set of separating quality levels as an interval bounded by

$$(1) \quad q_g^{\min} = \min \left\{ q_g \in [\underline{q}, \bar{q}] : \right. \\ \left. v(p, y_L - \gamma_L p q_g) \leq u(q_g, y_L - \gamma_L p q_g) \right\}$$

⁴As Dan Usher (1977) observes, this might not be the case if a proportional income tax were used to finance public provision. Yet once both rich and poor are consuming in the public sector, it is better to abandon a program that provides a universal quality level of the indivisible good in favor of one that provides a uniform cash transfer.

and

$$(2) \quad q_g^{\max} = \max \left\{ q_g \in [\underline{q}, \bar{q}] : \right. \\ \left. v(p, y_H - \gamma_L p q_g) \geq u(q_g, y_H - \gamma_L p q_g) \right\}.$$

Equations (1) and (2) give the lowest quality at which the poor participate in the public sector and the highest quality level at which the rich do not participate, when the government levies a head tax equal to $\gamma_L p q_g$. If the government confines its choice of quality to the separating interval $[q_g^{\min}, q_g^{\max}]$, then only low-income individuals will consume in the public sector. There will exist a range of separating quality levels provided that the rich are not attracted by free provision of the lowest possible quality level [i.e., $q_g^{\min} < q_g^{\max}$ if $v(p, y_H - \gamma_L p q) > u(q, y_H - \gamma_L p q)$]. More generally, the size of the interval of separating qualities will depend positively on the magnitude of the income difference between rich and poor and on the income elasticity of demand for quality.

Associated with each quality level $q_g \in [q_g^{\min}, q_g^{\max}]$ will be a pair $(u(q_g, y_L - \gamma_L p q_g), v(p, y_H - \gamma_L p q_g))$ in utility space. By varying q_g we can trace out the utility allocations that can be reached using public provision. This will provide us with a picture of the redistributive potential of universal public provision as we have described it.

In undertaking this task, it will prove useful to employ a monetary measure of the value that low-income individuals attach to public provision. To this end, we define $m(q_g)$ from

$$(3) \quad v(p, y_L + m(q_g) - \gamma_L p q_g) = u(q_g, y_L - \gamma_L p q_g).$$

For any given quality level q_g , the function $m(q_g)$ represents the amount of money that a poor individual would have to be given to make him as well off choosing q in the private sector, as he is with public provision

at quality level q_g (assuming that in either case he pays taxes of $\gamma_L pq_g$). It is, therefore, a poor individual's *equivalent variation* associated with the publicly provided quality level.

The properties of $m(q_g)$ are central to understanding the shape of the utility-possibility frontier with public provision. Thus, it is helpful to solve for $m(q_g)$ explicitly using the consumer's expenditure function, denoted here by $e(p, u)$. Making use of this in inverting (3), we obtain

$$(4) \quad m(q_g) = e(p, u(q_g, y_L - \gamma_L pq_g)) - (y_L - \gamma_L pq_g).$$

It is immediate from (4) that $m(q_g)$ can be no greater than pq_g , which reflects the fact that the value of an in-kind transfer can be no greater than its cash value. The difference between pq_g and $m(q_g)$ can be thought of as a measure of the deadweight loss associated with public provision.

Three properties of the equivalent variation are key. First, note that if $q_g^{\min}$ exceeds q , then $m(q_g^{\min})$ must equal zero. This follows immediately from (3) after noting that $u(q_g^{\min}, y_L - \gamma_L pq_g^{\min})$ equals $v(p, y_L - \gamma_L pq_g^{\min})$ if $q_g^{\min}$ exceeds q . For the second property, we need to introduce q_g^* as the quality level implicitly defined by the equation

$$(5) \quad q_g^* = q(p, y_L + pq_g^* - \gamma_L pq_g^*).$$

Hence q_g^* is the quality level that would be chosen by a poor individual who was given a cash transfer of pq_g^* and was required to pay taxes of $\gamma_L pq_g^*$.⁵ The important feature of this quality level is that $m(q_g)$ equals pq_g if and only if q_g equals q_g^* . Thus, it is the

unique quality level at which there is no deadweight loss from public provision. It is easy to see that the deadweight loss is zero, since q_g^* is precisely the quality level that a poor individual would have chosen were he given cash equal to the cost of making an in-kind transfer at this quality level.

The third property to note is that $m'(q_g)$ exceeds $\gamma_L p$ in the interval $[q_g^{\min}, q_g^*]$. Thus, when quality is above the minimal separating quality level but less than q_g^* , an increase in quality raises the utility level of a poor individual [see the left-hand side of (3)]. This is best understood with reference to the right-hand side of (3). A small rise in quality increases a poor person's utility provided that u_q exceeds $u_z \gamma_L p$. However, we know that u_q equals $u_z p$ at q_g^* and that we are interested in q 's less than this. Moreover, our assumptions imply that u_q/u_z is decreasing in q and increasing in z . The result now follows, once it is remembered that a small increase in quality lowers z because of the increase in the tax required to finance it.

Using all of this, we can trace out the utility allocations that can be achieved using public provision. There are two cases to consider. The first occurs when q_g^* is a separating quality level so that q_g^* is less than $q_g^{\max}$. In this case, the utility feasibility frontier will be a curve such as DEF in Figure 1. Point D is associated with the quality level $q_g^{\min}$. At this point, both high- and low-income individuals are worse off than in the status quo at B, since, as we noted above, $m(q_g^{\min})$ equals zero in this case.⁶ The rich are worse off because they have to pay taxes but obtain nothing in return. The poor do receive an in-kind transfer, but the quality level is so low that they do not value it. They also have to pay taxes to help finance it.

Point E is associated with the quality level q_g^* . Since there is no deadweight loss at this quality level, the feasibility frontier with

⁵Such a quality level exists and is unique if poor individuals would choose to consume the indivisible good if given a cash transfer of pq and required to pay taxes of $\gamma_L pq$. In establishing the uniqueness of q_g^* , we use the assumption that good z is normal, since if the marginal propensity to consume quality is less than 1, the derivative of the right-hand side of (5) with respect to q_g is less than 1.

⁶This assumes that $q_g^{\min}$ exceeds q . If $q_g^{\min}$ equals q and $u(q, y_L - \gamma_L pq)$ exceeds $v(p, y_L - \gamma_L pq)$, the point D will lie to the north of where it is located in Figure 1.

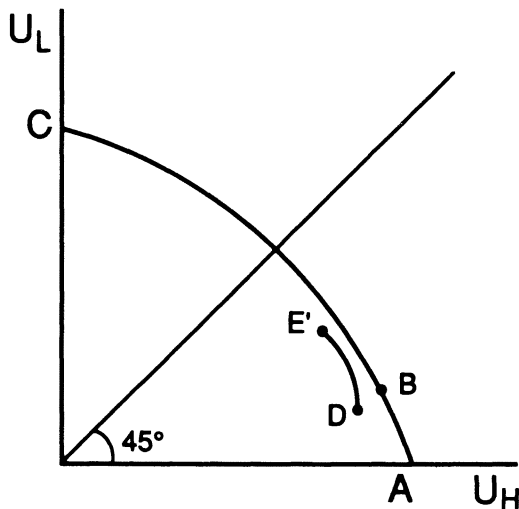


FIGURE 2. THE ECONOMY'S PARETO FRONTIER (AC) AND UTILITY-FEASIBILITY FRONTIER (DE') WITH PUBLIC PROVISION WHEN $q_g^{\max} < q_g^*$

public provision meets the Pareto frontier at this point. To discern the shape of the feasibility frontier for quality levels between $q_g^{\min}$ and q_g^* , we use the fact, established above, that the poor's utility is increasing in quality in this range. At the same time, the utility of the rich is decreasing, since they face a higher tax bill.

Finally, point F is associated with the quality level $q_g^{\max}$. Provision of any higher quality level than this would attract the rich to consume in the public sector and would thus result in a Pareto-inferior allocation to the southwest of B. It should be noted that, contrary to the way we have drawn it, the frontier may actually turn downward at some quality level between q_g^* and $q_g^{\max}$. This will occur if the value of additional quality to poor individuals, $m'(q_g)$, becomes smaller than the increase in the head tax, $\gamma_L p$, which it necessitates.

The second case to consider occurs when the quality level q_g^* is not separating. The feasibility frontier will then be a curve like DE' in Figure 2. Point D is still associated with the quality level $q_g^{\min}$, while the point E' is associated with the quality level $q_g^{\max}$, the highest quality level that can be provided without attracting the rich to consume

in the public sector. Since $q_g^{\max}$ is less than q_g^* , the frontier cannot turn downward. It is, however, everywhere inside the Pareto frontier.

It is important to note that, in either case, the feasibility frontier with public provision cannot cross the 45° line, and hence universal provision cannot result in the poor having as much utility as the rich. This is because the rich would always wish to consume a quality level that gives poor individuals a higher utility level than it gives the rich. Hence, any such quality level cannot be separating. Thus, there is a definite limit to the amount of redistribution that can be achieved with this instrument.

II. Concluding Remarks

The analysis of the previous section suggests that universal provision of certain types of private goods can redistribute income from the rich to the poor. It is important to note, however, that this does not imply that such schemes will form part of a properly designed redistributive package. As our analysis makes clear, there is a deadweight loss associated with universal provision, and there may exist other feasible policies that can achieve the same distributional goals more efficiently. In thinking about this issue, one should make a distinction between different cases based on the cost to the government of observing its citizens' incomes.

If the cost of measuring incomes is prohibitive, as is the case in many less developed countries, the government must rely primarily on commodity taxes and subsidies to redistribute between individuals, supplemented perhaps by uniform lump-sum taxes or transfers. The relevant question in this context, therefore, is whether public provision can be used to reach allocations not achievable with commodity taxes/subsidies and uniform lump-sum taxes/transfers alone. There are, we believe, good theoretical reasons for being sanguine about the role for universal public provision with such limited redistributive instruments. First, analyses such as that by Raaj Kumar Sah (1983), suggest that little redistribution

is possible using commodity taxes and subsidies. Second, universal public provision allows the government to use its revenues in a targeted fashion, since only the poor participate. This is likely to permit more significant redistribution to the poor than would be possible using only uniform lump-sum grants.

If income data are available to the government, it may employ income taxes and transfers. In the simple model used in the previous section, where individuals' incomes are given exogenously, this would, of course, make universal provision redundant, since income taxes and transfers would incur no deadweight loss. However, allowing for the fact that incomes are determined by labor supply and human capital investments, it would be necessary to take the distortionary effects of income taxes into account. Appealing to results in the existing literature on cash versus in-kind transfers would suggest that the case for universal public provision in this context, would have to rest either on interactions between labor supply and human capital decisions and the publicly provided good⁷ or on individuals hav-

ing different and unobservable needs for the publicly provided good.⁸

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⁷In the context of the optimal-income-tax model, Aanund Hylland and Richard J. Zeckhauser (1979) show that, if agents' valuations of public programs depend solely on their incomes, all redistribution should be undertaken through income taxes, rather than public programs.

⁸Charles Blackorby and David Donaldson (1988) and Albert L. Nichols and Zeckhauser (1982) have shown that in-kind transfers may play a useful screening role when individuals have different and unobservable needs.